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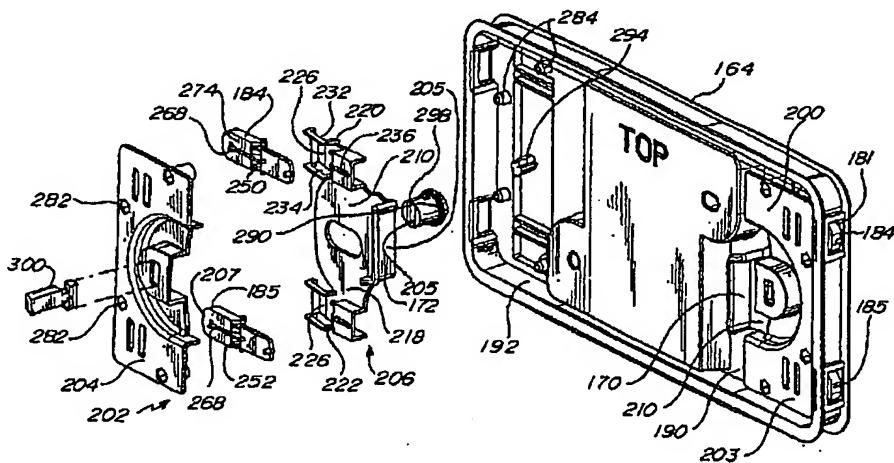
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(54) Title: TRANSPORT MODULE WITH LATCHING DOOR



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(57) Abstract: A wafer container with door receiving frame and a door sized therefor. The door (94) includes latching linkages (250, 252) that extend, lift, lower and retract latching portions from the door and into and out of latch receptacles (150) in the door frame. Each latching mechanism utilizes a sliding plate (210) with a connected handle (170, 172) exposed on the front of the door. The sliding plate has lifting linkages (220, 222) cooperating with the latching linkages. Moving the handles extends the latching portions into the latching receptacles. By way of a ramped surface (226) and follower surface (277) on the overlapping linkages, the latching portions then move in a direction normal to the first direction to pull the door inwardly and seal the door to the container. The sliding plate includes a rack portion (224) engaged with a pinion (290). The pinion is accessible from the door front by a latch key (300).

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## AMENDED CLAIMS

[received by the International Bureau on 18 December 2000 (18.12.00);  
original claims 1, 2, 5, 10, 12, 13 and 17 amended;  
remaining claims unchanged (7 pages)]

1. A sealable container for enclosing wafers, the container comprising:
  - a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle; and
  - b) a door placeable in the door frame to cover the door opening and seal with the container portion thereby sealing the wafers in the container, the door having a front and comprising:  
an outer seating portion sized for engaging with the generally rectangular door frame, and  
a latching mechanism comprising:  
a handle exteriorly exposed on the front of the door, said handle laterally moveable,  
a latch portion for extending into and retracting from the latch receptacle, and  
a motion translation portion connecting between the latch portion and the handle for translating lateral motion of the handle into extending and retracting of the latch portion.
2. The wafer carrier of claim 1 wherein the motion translation portion is not within a door enclosure.
3. The wafer carrier of claim 1 wherein the motion translation portion comprises a rack and pinion.
4. The wafer container of claim 1 wherein the door has a left side and a right side, and wherein the latch mechanism is a first latch mechanism and the wafer container further comprises a second latch mechanism and wherein the first latch mechanism is positioned on the left side of the door and the second latch mechanism is positioned on the right side of the door.
5. A wafer container comprising:
  - a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having a front and an outer seating portion sized for engaging with the generally rectangular door frame.

a latching mechanism comprising:

a latch portion for engaging with the latch receptacle,  
a first actuation portion for receiving manual and robotic actuation, and  
a motion translation portion connecting between the latch portion and the actuation portion for translating actuation of the handle into engagement of the latch portion with the latch receptacle.

the motion translation portion mounted and exposed on the front of the door providing access to said motion translation portion.

6. The wafer container of claim 5 wherein the latching mechanism further comprises a second actuation portion, and wherein the second actuation portion is a rotatable latch key receiver and the first actuation portion is a manually operable handle.

7. The wafer container of claim 6 wherein the manually operable handle is non-rotatable.

8. The wafer container of claim 5 wherein the motion translation portion comprises a rack and a pinion mechanism.

9. The wafer container of claim 5 wherein the latching mechanism comprises:

a latch arm with two ends, one end having a cam follower engaged to the first cam guide and the other end having a latch portion extending to the opening in the outer seating portion, the lifting linkage having a first lifting portion intermediate the two ends, the first cam guide configured to extend the latch portion outwardly with respect to the door in a first direction into the latch receptacle; and

a lifting linkage connected to the sliding handle portion and laterally moveable therewith, the lifting linkage having a cooperating second lifting portion engageable

with said first lifting portion, the first lifting portion and the second lifting portion arranged in an overlapping relationship, one of said first lifting portion and said second lifting portion having a ramp and the other of said first lifting portion and said second lifting portion have a ramp engagement surface, the second cam guide configured to move the lifting linkage with respect to the latch linkage whereby the ramp engagement portion rides on the ramp to move the latch linkage in a second direction substantially normal to the first direction when the latching portion is in the latch receptacle.

10. A sealable wafer container comprising:

- a) a container portion for holding wafers, the container portion having an open interior, an open front, and a generally rectangular door frame at the open front defining a door opening, the door frame having a latch receptacle;
- b) a door placeable in the door frame to cover the door opening and seal with the container portion, the door comprising:

an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

- a actuation portion for receiving external actuation, the actuation portion exteriorly accessible and rotatable,
- a latch portion for engagement with the latch receptacle,
- a pinion connected to the actuation portion, and
- a rack engaged with the pinion and connecting to the latch portion, whereby rotation of the actuation portion moves the latch portion.

11. The wafer container of claim 10 wherein the door has a front and the latch mechanism is exposed on the front of the door.

12. The wafer container of claim 10 wherein the actuation portion is a first actuation portion and wherein the latch mechanism further comprises a second actuation portion that is constrained to move laterally, the second actuation portion connecting to the rack, whereby

the latch mechanism may be actuated by either rotating the first actuation portion or by laterally moving the second actuation portion.

13. The wafer container of claim 12 wherein the door has a front and the latching mechanism is exposed on the front.

14. The wafer container of claim 10 wherein the door has a front, a left side, and a right side, and wherein the latch mechanism is a first latch mechanism and the wafer container further comprises a second latch mechanism and wherein the first latch mechanism is positioned on the left side of the door and the second latch mechanism is positioned on the right side of the door.

15. A wafer container comprising:

a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a forward facing door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having a front and an outer seating portion sized for engaging with the generally rectangular door frame,

a latching mechanism comprising:

a latch portion for engaging with the latch receptacle,

a first rotatable actuation portion for receiving robotic actuation with a key,

a second laterally moveable actuation portion for manual actuation,

a motion translation portion connecting between the latch portion and the first robotic actuation portion and between the latch portion and the second laterally moveable actuation portion for translating actuation of said actuation portions into engagement of the latch portion with the latch receptacle.

16. The wafer carrier of claim 15 wherein the motion translation portion comprises a rack and pinion.

17. The wafer carrier of claim 15 wherein the latch mechanism is mounted on said front and is not contained within a door enclosure.

18. The wafer carrier of claim 15 wherein the latching mechanism is a first latching mechanism and the wafer carrier further comprises a second latching mechanism that is substantially a mirror image of the first latching mechanism.

19. The wafer carrier of claim 15 wherein the motion translation portion provides a laterally outward motion to the latching portion and a motion in a forward direction.

20. A wafer container comprising:

a) a container portion for holding wafers, the container portion having an open interior and a generally rectangular door frame defining a door opening, the door frame having a latch receptacle;

b) a door placeable in the door frame to cover the door opening, the door having an open interior and comprising:

i) an outer seating portion sized for engaging with the generally rectangular door frame, the outer seating portion having an opening corresponding to the latch receptacle when the door is placed in the door frame;

ii) a sliding handle portion constrained and laterally moveable within the enclosure, said portion including a handle exteriorly exposed on the front of the door;

iii) a latch arm with two ends, one end having a cam follower engaged to the first cam guide and the other end having a latch portion extending to the opening in the outer seating portion, the lifting linkage having a first lifting portion intermediate the two ends, the first cam guide configured to extend the latch portion outwardly with respect to the door in a first direction into the latch receptacle; and

iv) a lifting linkage connected to the sliding handle portion and laterally moveable therewith, the lifting linkage having a cooperating second lifting portion engageable with said first lifting portion, the first lifting portion and the second lifting portion arranged in an overlapping relationship, one of said first lifting portion and said second lifting portion having a ramp and the other of said first lifting portion and said second lifting portion have a ramp engagement surface, the second cam guide configured to move the lifting linkage with respect to the latch linkage whereby the ramp engagement portion rides on the ramp to move the latch linkage in a second direction substantially normal to the first direction when the latching portion is in the latch receptacle.

21. The wafer carrier of claim 20 further comprising a rack and pinion gear system connected to the sliding handle portion, the pinion accessible from exterior of the door whereby the door can be robotically operated by engagement with said pinion.

22. A wafer carrier comprising:

- a) a container portion for holding wafers in a horizontal arrangement, the container portion having an open front and a latch receptacle on the container portion at the open front; and
- b) a door placeable to close the open front, the door comprising;

i) a latching arm having a latching portion extendable outwardly in a first direction towards the latch receptacle; and

ii) a lifting linkage adjacent the latch linkage and moveable in a direction substantially parallel to the first direction, at least one of the lifting linkage and the latching arm having a ramp such that when the other of the lifting linkage and the latching portion moves with respect to the ramp, the ramp causes the latching linkage to be moved in a second direction substantially normal to the first direction;

iii) a sliding handle portion constrained and laterally moveable within the enclosure, said portion including a handle exteriorly exposed on the front of the door and a connecting portion connecting the handle to the lifting linkage, whereby the

door may be operated by moving the exteriorly exposed handle, the handle portion further comprising a linear gear fixed thereto; and

iv) a rotatable circular gear within the door enclosure engaged with the linear gear, the circular gear accessible from the front exterior of the door whereby the door may be robotically operated.

23. The wafer carrier of claim 3 wherein the sliding handle portion is integral with the lifting linkage.